THE Cane Growers' QUARTERLY BULLETIN

VOL. XIX., No. 4 1 APRIL, 1956

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THE
CANE GROWERS'
QUARTERLY BULLETIN

ISSUED BY DIRECTION OF THE
SUGAR EXPERIMENT STATIONS
BOARD

1 APRIL, 1956

Wholly set up and printed in Australia by
WATSON, FERGUSON AND COMPANY
Brisbane, Q.

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This Bulletin is an official publication of the extension service of the Bureau of Sugar Experiment Stations, issued and forwarded by the Bureau to all cane growers in Queensland.

The

Cane Growers' Quarterly Bulletin

VOL. XIX. 1 APRIL, 1956 No. 4

Farm Fertilizer Trials

RESULTS OF THE 1955 SEASON

By L. G. VALLANCE AND K. C. LEVERINGTON

It was again necessary to curtail somewhat the number of farm fertilizer trials because of the pre-occupation of the field staff with disease control work. Nevertheless several very interesting trials were harvested. The results obtained will be of value in assisting growers to utilise fertilizer as beneficially and economically as possible. A trial carried out on the red volcanic soil at Green Hill showed that adequate potash application was necessary on this soil type. At Ingham the first fertilizer trial for very many years was harvested, and Herbert River growers will no doubt be interested in the results since planting mixtures containing high nitrogen were compared with normal recommended practices in which the bulk of the nitrogen required is applied as a top dressing.

For those farmers who take a particular interest in soil fertility investigations it may be pointed out that the experiments reported below are not, by any means, a complete record of this type of work at present in progress. At Bundaberg and Mackay Sugar Experiment Stations trials are being carried out to investigate to what extent c.c.s. is influenced by the amount of sulphate of ammonia used and the time at which it is applied. Some of the results of these experiments have already been printed in the Quarterly Bulletin and further details will be published as they come to hand from time to time.

Present day production and harvesting costs have narrowed the margin between profit and loss and therefore the growing of high quality cane is becoming ever more important. Admittedly insofar as sugar content is concerned the influence of variety is very great. However, the canes which we have in use to-day have proved their ability to produce good sugar providing they are given suitable growing conditions and the correct type of fertilizer. It is in this latter respect that the grower is able to exert some influence, not only over the quality of his crop, but also over the cost of its production.

R. K. & I. M. GREENWOOD, Green Hill.

Soil type: Red volcanic. **Nature of crop:** Plant.
Variety: Pindar. **Age of crop:** 15 months.
Harvested: September, 1955.

SUMMARY OF CROP YIELDS

Fertilizer	Rate per acre	Yield, tons cane per acre
Sulphate of ammonia	Nil	35.11
	200 lb.	35.56
	400 lb.	36.76
Superphosphate	Nil	36.43
	200 lb.	36.22
	400 lb.	34.79
Muriate of potash	Nil	34.61
	150 lb.	37.62
	350 lb.	35.21

DISCUSSION.

The results of this trial are rather disappointing in that Red Rot was present in many growth cracks of the cane at harvest which made the c.c.s. values obtained rather unreliable. However, with regard to cane tonnage potash was the only plant food to give a significant response and it is considered that a high potash mixture would be the most suitable fertilizer for this soil type. Like on many other red volcanic soils, nitrogen failed to significantly increase the yield of this plant crop, although it is quite probable that some improvement will be observed in the ratoons.

LOW NITROGEN *versus* HIGH NITROGEN PLANTING MIXTURES.

BOVERO BROS., Beeva, via Ingham.

Soil type: Forest. **Nature of crop:** Plant.
Variety: Pindar. **Age of crop:** 14 months.
Harvested: September, 1955.

SUMMARY OF CROP YIELDS

Planting Mixture	Amounts per acre	Yield, tons per acre	
		Cane	Sugar
LOW NITROGEN	5 cwt. Sugar Bureau No. 2 in drill at planting in July, *plus two bags sulphate of ammonia as a top dressing in September*	44.3	6.4
HIGH NITROGEN	5 cwt. Sugar Bureau No. 2 plus two bags sulphate of ammonia all applied in the drill at planting ..	43.7	6.2

DISCUSSION.

This trial was designed to compare LOW nitrogen and HIGH nitrogen planting mixtures. In one set of plots 5 cwt. per acre of Sugar Bureau No. 2 Mixture was placed in the drill with the plants and about two months later two bags per acre of sulphate of ammonia was applied when the cane was up, as a top dressing. In the second set of plots all this fertilizer was applied at planting. The above results show that there was practically no difference in the yields of the two treatments, either in cane or sugar per acre.

In this experiment great care was taken to avoid the fertilizer coming into contact with the plants in the drill. It is a well known fact, however, that considerable fertilizer burn often occurs, particularly when high nitrogen mixtures are put in the drill with the plants (*see* page 7, Quarterly Bulletin, July,

1955). The result of this trial shows that it is not necessary to take this risk and the bulk of the nitrogen required by the crop can be efficiently applied as a sulphate of ammonia top dressing.

In the trial also the use of three bags of sulphate of ammonia was compared with that of two bags. These two treatments gave almost exactly the same results, *i.e.*, about 6.3 tons of sugar per acre in each case. It was quite evident that the cost of the extra bag of sulphate of ammonia was wasted.

CLAUSSEN & CO., Giru.

Soil type: Alluvial loam.
Variety: Q.57.
Nature of crop: Plant cane.
Age of crop: 16½ months.
Harvested: October, 1955.

SUMMARY OF CROP YIELDS

Fertilizer	Rate per acre	Yield, tons sugar per acre
Sulphate of ammonia	Nil	5.49
	200 lb.	6.09
	400 lb.	5.61
Superphosphate	Nil	5.83
	200 lb.	5.84
	400 lb.	5.51
Muriate of potash	Nil	5.94
	150 lb.	5.66
	300 lb.	5.59

DISCUSSION.

No significant response in the yield of either cane or sugar per acre was obtained from any of the plant foods used in this trial. Although it was expected that some improvement in yield would result from the use of sulphate of ammonia, the erratic nature of the c.c.s. values due to bad rat damage prevented the small increases obtained from being regarded as significant. The lack of increase in yield from additions of either phosphate or potash was foreshadowed by the chemical analysis of the soil which was well supplied naturally with both of these nutrients.

J. T. McCOWATT, Walkerston.

Soil type: Black pug clay.
Variety: Q.50.
Nature of crop: Plant.
Age of crop: 16 months.
Harvested: December, 1955.

SUMMARY OF CROP YIELDS

Fertilizer	Rate per acre	Yield, tons sugar per acre
Sulphate of ammonia	Nil	3.98
	200 lb.	4.12
	400 lb.	4.41
Superphosphate	Nil	3.27
	200 lb.	4.54
	400 lb.	4.71
Muriate of potash	Nil	4.31
	150 lb.	4.03
	300 lb.	4.18

DISCUSSION.

This is the first crop of cane grown on the block and it is interesting to note the responses gained from the use of ammoniacal and phosphatic fertilizers. The application of 400 lb. of sulphate of ammonia increased the yield of sugar by almost half a ton per acre whilst 400 lb. of superphosphate was responsible for an increase in sugar per acre of 1.44 tons. It is probable that the late harvest of this trial was partially responsible for the increase in yield due to nitrogen as the c.c.s. was slightly higher in these plots than in the no nitrogen plots. It appears that the low c.c.s's often associated with heavy applications of sulphate of ammonia are not evident if the cane is harvested late in the season. The response due to superphosphate was evident early in the trial and at harvest the 400 lb. and 200 lb. treatments yielded 30.6 and 27.2 tons of cane per acre respectively compared with a no phosphate treatment yield of 19.4 tons per acre.

There was no response either in cane per acre or in sugar per acre to applications of potash.

Chemical analyses had previously indicated that whilst the soil was well supplied with potash the phosphate content was very low.

W. BLACKBURN, North Eton.

Soil type: Brown clay loam.
Variety: Q.50.
Nature of crop: Second Ratoon.
Age of crop: 13 months.
Harvested: October, 1955.

SUMMARY OF CROP YIELDS

Fertilizer	Rate per acre	Yield, tons sugar per acre		
		Plant crop	First ratoon	Second ratoon
Sulphate of ammonia ..	Nil	5.40	2.49	1.59
	200 lb.	6.09	3.91	2.22
	400 lb.	6 42	4.90	2.93
Superphosphate	Nil	5.98	3.95	2.32
	200 lb.	5.98	3.75	2.24
	400 lb.	5.94	3.60	2.18
Muriate of potash ..	Nil	5.94	3.52	2.12
	150 lb.	5.97	3.80	2.34
	300 lb.	5.99	3.98	2.28

DISCUSSION.

In the second ratoon crop of this trial in which various combinations of potash, phosphate and nitrogen were used, the greatest response was again due to dressings of sulphate of ammonia. Over the complete crop cycle, sulphate of ammonia at the rate of 200 lb. per year increased the yield of sugar per acre by a total of 2.74 tons. Similarly, a dressing of 400 lb. of sulphate of ammonia per year was responsible for lifting the yields by 4.77 tons of sugar per acre. One interesting feature was that there was no drop in the c.c.s. values which is often associated with heavy dressings of nitrogenous fertilizers.

With regard to superphosphate fertilization there was again no response to dressings of this plant food. This was to be expected, however, as chemical analyses had indicated that the soil was well supplied with this nutrient.

In the second ratoon crop, where adverse seasonal conditions reduced the average yield to only 13 tons cane per acre, there was no response to potash

fertilizer. This was in contrast with the first ratoon crop, where a dressing of 300 lb. per acre of muriate of potash increased the yield of sugar by 0.46 tons per acre. It appears, then, that although there was sufficient potash in the soil to support the growth of a 13 ton crop, extra potash from the fertilizer was utilised in the production of the first ratoon crop averaging 22 tons. Consequently it is considered that regular light dressings of muriate of potash should be made to this soil to ensure that the potash supply is sufficient for the production of good yields of cane.

J. C. V. DOWLING & CO., North Isis.

Soil type: Red volcanic and marginal forest.

Variety: C.P.29/116.

Nature of crop: First Ratoon.

Age of crop: 13 months.

Harvested: January, 1956.

SUMMARY OF CROP YIELDS

Fertilizer	Rate per acre	Yield, tons sugar per acre			
		Plant crop	First ratoon	Second ratoon	Total
Sulphate of ammonia	Nil	5.65	6.35	4.34	16.34
	200 lb.	5.59	7.33	5.01	17.93
	400 lb.	5.66	7.78	5.91	19.35
Superphosphate ..	Nil	5.31	7.13	4.57	17.01
	200 lb.	5.61	7.05	5.42	18.08
	400 lb.	5.99	7.28	5.26	18.53
Muriate of potash ..	Nil	5.49	7.06	4.30	16.85
	150 lb.	5.52	6.98	5.79	18.29
	300 lb.	5.89	7.42	5.17	18.48

DISCUSSION.

Nitrogen.—The improvement in yield of sugar per acre shown in the first ratoons of the trial was again apparent in this crop, showing that while the green manure crop ploughed in prior to planting supplied sufficient nitrogen for the plant crop, it is necessary to top dress all ratoons with sulphate of ammonia for optimum yields.

Phosphate.—Once again there were signs of a slight increase in yield due to this plant food. However, as the growth in some of the plots was rather erratic it cannot be definitely concluded that dressings of superphosphate are responsible for any increase in sugar per acre on this soil.

Potash.—Throughout the three crops potash fertilization has brought about a slightly increased yield in sugar per acre, a dressing of 300 lb. of muriate of potash per acre each year being responsible for the production of an additional 1.6 tons of sugar per acre.

LIME TRIAL.

J. J. TOOMEY, Maroochy River.

Soil type: Alluvial clay loam.

Variety: Q.50.

Nature of crop: Third Ratoon.

Age of crop: 10 months.

Harvested: September, 1955.

SUMMARY OF CROP YIELDS

Treatments	Yield, tons cane per acre				Total
	Plant crop	First ratoon	Second ratoon	Third ratoon	
3 tons of lime per acre broadcast ..	37.2	33.0	31.9	24.0	126.1
30 cwt. of lime per acre broadcast ..	35.4	31.9	36.1	24.2	127.6
15 cwt. of lime per acre broadcast ..	34.8	31.1	31.4	24.1	121.4
15 cwt. of lime per acre in the drill ..	34.4	32.2	33.1	23.6	123.3
No lime	33.8	31.6	33.6	23.7	122.7

DISCUSSION.

Although this trial has now been taken through to the third ratoon crop no conclusive evidence has been obtained to show that lime applications are beneficial. Only in the plant crop did the lime cause a significant increase in the yield of cane per acre, so that the cost of liming the soil is hardly justified.

A Cane-truck Trailer

We are indebted to Mr. H. C. Morton, Gordonvale, for the accompanying details and photographs (Figs. 83, 84, 85) of a unit designed to carry three empty cane trucks, together with another on the motor lorry itself. Mr. Morton writes:—

"Perhaps the most efficient of motor transport methods is the system where empty trucks are left in the paddock,

Fig. 83—Showing method of loading the Ridolfi trailer

Fig. 84—The Ridolfi trailer loaded.

usually in the early morning, and full trucks hauled whenever convenient throughout the day.

"The main problem confronting the individual farmer hauling to a large gang, or the contractor serving a number of farmers, is the need to carry sufficient empty trucks to the field in the limited time at their disposal. It has been successfully proved in more than one far northern area, that a simple semi-trailer will eliminate this problem.

"Typical of these is the one built by Mr. V. Ridolfi, contract cane hauler of Gordonvale. The Ridolfi trailer is designed to carry three empty trucks, plus one carried on the lorry itself. The trailer is manoeuvrable, and can be trailed safely at all normal driving speeds. Empty trucks are hauled from the line by winch, four at a time, the leading truck mounting a step, consisting of a miniature riding points, to allow it to transfer from the trailer to the lorry proper. The trailer is joined to the lorry by a pin, transfixing a simple drawbar, and can be removed from the lorry in seconds. A stand on the front of the trailer is dropped on to the ground, leaving it at suitable re-hitching height.

"The trailer was constructed from an old three-ton lorry chassis, at a total cost of £150. Overall length of the trailer is 22 feet."

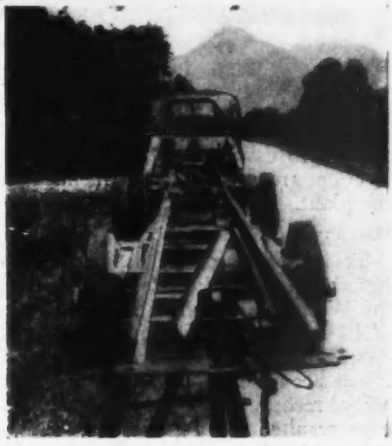

Fig. 85—A rear view of the Ridolfi trailer.

The Giant Sensitive Plant

By S. O. SKINNER and J. ANDERSON

Most landholders in the central and northern coastal areas of Queensland are familiar with the common sensitive plant (*Mimosa pudica*). This is a rather small prickly weed of comparatively minor importance.

During recent years considerable attention has been focused on a second and much larger variety most aptly termed the *giant* sensitive plant (*Mimosa invisa*). Enquiries are received regularly concerning this newer pest and the following article is intended to cover the history, present location, recognition and menace of the plant.

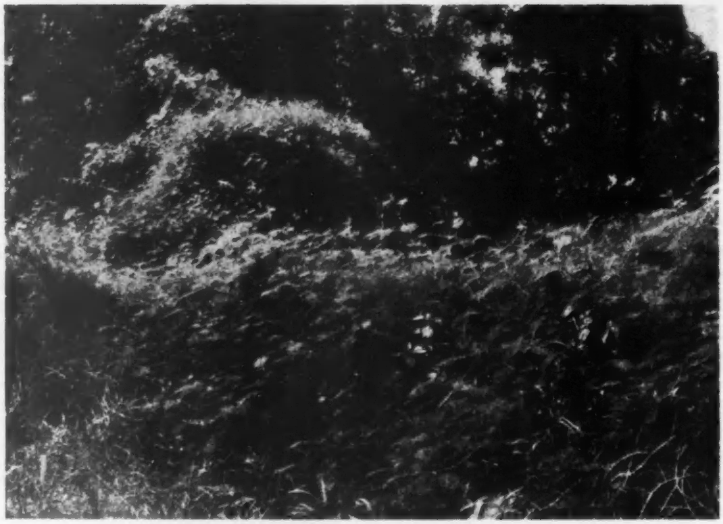

Fig. 86—Giant sensitive plant smothering a fence and a bush.

History and Present Location

This giant species is native to Brazil and is widely spread in Mexico, the West Indies and Fiji. The mode of its entry into Queensland is not clear, and while there is evidence that it has been here for many years, first official recording of the pest appears to have resulted from specimens submitted to the Government Botanist in 1944. These were from several isolated patches in Tully and Innisfail. The early spread from these confined areas was slow, but ultimately more frequented areas such as pastures, cultivations and roadsides, became infested and the spread then became much more rapid. Small findings in Babinda have shown that it has extended to this district, and mill areas now affected to a greater or lesser extent, are: Babinda, Goondi, South Johnstone, Mourilyan and Tully.

Description of the Pest

Giant sensitive plant is shrub-like in growth with long branching stems. These scramble through and over all small vegetation to completely smother it with an impenetrable thorny mass (Fig. 86). Amongst larger growth, these stems will crawl and climb to attain a length of up to forty feet or more (Fig. 87).

Although the size of the mature plant distinguishes it readily from the common sensitive plant, other major

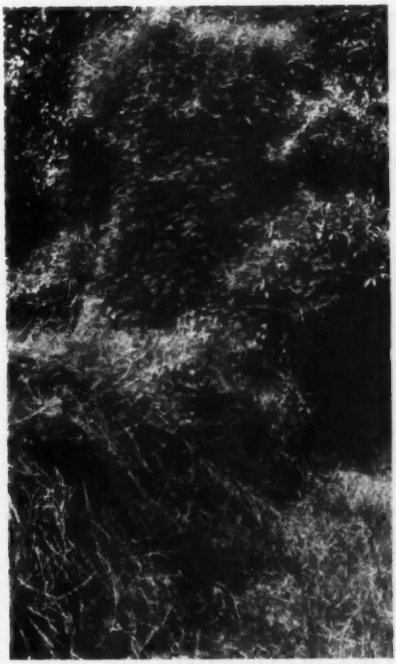

Fig. 87—Giant sensitive plant commencing to climb. It will ultimately completely cover the tree.

features that allow it to be immediately recognised at all stages of growth are the characteristic appearance of the leaf, stem and prickles.

Leaf

In general appearance the leaves of the two varieties, i.e., the common and the giant, appear somewhat similar. However, in Fig. 88 it can be observed that the common plant carries a set of leaflets at the end of the leaf stalk. These are usually four in number and somewhat resemble a hand in formation.

The leaf formation of the giant sensitive plant is entirely different. The leaflets occur in pairs spaced along the leaf stalk (Fig. 89) and in some cases up to ten pairs may be present.

Stem

While the cross section of the stem of the common sensitive plant is round in shape, that of the giant is angular, with four or five distinct corners. This difference is readily noticeable.

Prickles

The common plant has occasional stout prickles on the stem and hairs on the leaf stalk. Giant sensitive, however, is densely clothed with extremely sharp, hooked spines. These are located along the full length of the stem, protruding from each of the four corners, and from the leaf stalks. The sharpness and tenacity of these spines are such as to completely rebuff any attempt by man or beast to push through a dense stand of the pest.

Other Features

Flowers and seeds of the giant plant are borne in heads similar to those of the common variety. The heads are composed of pods approximately one inch long and a quarter inch wide which in turn break up into four or five one-seeded sections.

The colour of the foliage is of a lighter green than that of the common sensitive plant, while the sensitivity of the leaf on touching is not as pronounced as that of the common variety.

Fig. 88—Common sensitive plant. The four leaflets arise from the end of the stalk.

Summary of the Differences for Ready Recognition

Feature	*Giant Sensitive Plant*	*Common Sensitive Plant*
Leaf	Five to ten pairs of leaflets *along* leaf stalk (Fig. 4).	Usually four leaflets on the *end* of the leaf stalk (Fig. 3).
Stems	Angular, with four or five corners.	Round.
Prickles	Massed, sharp and hooked, along entire stem and leaf stalk.	Odd stout thorns on stem with hairs only on leaf stalk.
Growth	Most prolific with long and rambling stems up to forty feet or more in length.	Small and bushy.
Colour	Light green foliage.	Dark green foliage.
Sensitivity	Leaf droops slowly on touch.	Leaf collapses rapidly on touch.
Habit	Most vigorous and smothering over all supporting vegetation.	Comparatively inconspicuous amongst other vegetation.

Method of Spread

The plant seeds most profusely, being propagated solely by this means. The seeds have unusually high viability capable of producing dense stands of young plants, while in addition, there are indications that they can remain dormant in the soil for lengthy periods of possibly four or more years. These hardy characteristics and the clinging nature of pod-bearing branches accelerate the distribution and establishment of the pest.

Fig. 89—Giant sensitive plant. Leaflets in pairs are spaced along the stalk.

Observations have shown that the transportation of seed-infested soil, and the movement of bulldozers, vehicles, implements and road machinery have all been responsible for the spread of the pest, while streams, animals and birds no doubt would play their customary part. Further, the haulage of cane from infested fields now presents an additional serious avenue for spread.

Threat to Land Usage

In cane lands, the pest is a particular threat to fields which cannot be easily cultivated and in which it can become well established. Growth during the wet season is very rapid and the pest has shown that it can readily penetrate, depress and completely smother a field of cane after the crop has passed the out-of-hand stage. Once established, harvesting is made extremely difficult and costly, and, in severe cases, impossible. (Figs. 90, 91).

With valuable coastal grazing land, the pest presents possibly an even greater threat than in cane, by overgrowing the grasses and dominating the pasture. (Figs. 92, 93). Once it becomes established in an area of broken terrain, control is particularly difficult and costly.

Control

The plant succumbs readily to most hormone and contact weedicides and fortunately in this respect is easier to kill than the common species. In cane, while frequent cultivation will

Fig. 90—Giant sensitive weed smothering and flattening a crop of Badila which would have yielded 30 tons per acre.

destroy most young seedlings, those surviving within the stool or germinating after the cane is out of hand call for the tedious and unpleasant task of hand pulling (with gloves and other protection) or knapsack spraying. In addition, boom spraying with 2,4-D during the early growth of the cane would no doubt prove effective, and in heavily infested fields, would assist in saving the cane crop. However, it must be stressed that for the complete eradication of the pest, several years of constant inspection and the immediate destruction of all plants to prevent any reseeding is most essential.

With the spread of the pest and finding of new isolated patches, immediate spraying with a quick killing weedicide is recommended. The arsenical sprays have been found very suitable since the pest and associated vegetation, after killing, can be burnt and the resulting bare spot watched for any further germination.

State Control

In 1948, after representations by the Bureau, the giant sensitive plant

Fig. 91—A cane crop on rich land being invaded by giant sensitive plant.

Fig. 92—Invasion of cattle fattening country at Innisfail by giant sensitive plant

Fig. 93—Pasture land with the grass entirely covered by giant sensitive plant.

was declared a noxious weed for the whole State of Queensland. The Department of Public Lands has now done a considerable amount of work in order to find an effective method of controlling the pest. The initial steps began with the aerial spraying, with 2,4-D, of the three major seed bed areas of Mourilyan, South Johnstone and Tully. This was attempted somewhat as an experiment to deal with the weed on broken land. However, the results were not entirely satisfactory in every instance, and the spraying is now to be followed up with ground work. It is of incidental interest to mention that this marked the first use of the aeroplane for agricultural spraying not only in North Queensland but also within the sugar industry.

The complete eradication of the pest will take many years of careful work. The successful completion of the campaign will be achieved only by the co-operation of all concerned, viz.: Local and Government Authorities, farmers' organizations and, in particular, the landholder himself.

As a final word of warning it is pointed out that although giant sensitive plant is still confined to comparatively localised areas, many acres of valuable cane and grazing land are definitely threatened. Thriving under our tropical climate, the pest presents a serious menace and landholders, familiar only with the common sensitive plant, should not underestimate the danger of the giant species. Growers finding the pest should take immediate action for its eradication and at the same time report the finding to their Local Authority.

Q.57 during the 1955 Season

By G. BATES

Q.57 is a variety now being propagated rapidly in North Queensland. Bred in Queensland, it originated at Meringa Experiment Station in 1945 from a cross between Q.27 and Q.31.

The parentage of Q.27 is unknown, but Q.31 is a cross between Oramboo and H.Q.409, two varieties well known to older cane growers.

Q.57 germinates well and is a strong ratooner. It is a strong grower, free trasher and seems best suited to medium lands. It rarely arrows. Its tonnage is quite satisfactory compared with standard varieties, while the c.c.s. content is good—particularly early in the season.

In Mossman area during 1955 season Q.57 was crushed over seventeen weeks, and only on three occasions was the weekly c.c.s. average of Q.57 under mill average, while on eight occasions it held the highest weekly average. It should be borne in mind, however, that at present Q.57 represents only one per cent. of the crop in that area, and the variety was harvested from selected land. When it assumes a larger percentage and is grown on a wider variety of soil types its average c.c.s. could be expected to drop somewhat.

In Babinda area Q.57 showed promising results and many farmers report splendid tonnages coupled with better than average c.c.s., particularly early in the season. The variety has been used to some extent on land where other crops lodge and produce no sugar, but the results have varied, in some cases very poor sugar being obtained. In these instances, however, the standard varieties would also have shown disappointing c.c.s.

Q.57 grown on good land suckered freely, and while these suckers produce sugar late in the year they are a disadvantage earlier in the season. One fault in Q.57 is its habit of lodging in heavy crops at the pre-harvest burn. Owing to its tendency of long growth and free trashing, the heat is concentrated at the base of the stool, resulting in lodging. This can be controlled to some extent by burning when a slow fire can be obtained.

The Williams Rear-end Loader

By N. McD. SMITH

The accompanying photograph (Fig. 94) shows a rear-end loader attached to a three-point linkage tractor. The implement was developed by Mr. W. Williams, Goodwood, who has applied for a patent on the arrangement which incorporates a simple, and easily operated grab release mechanism.

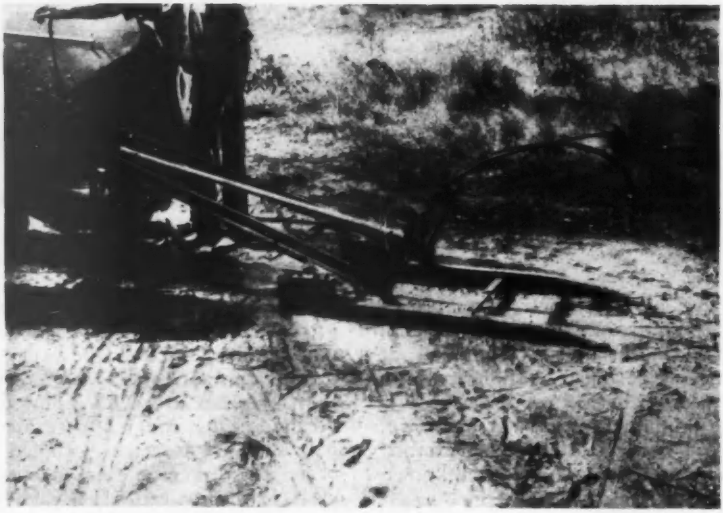

Fig. 94—The Williams rear-end loader attached to a three-point linkage tractor.

It will be seen that the attachment is not complicated and on cost, could be compared with other farm implements intended for three-point linkage. In detaching the loader an average time of 50 seconds is possible and about 3 cwt. per load is carried with a standard power lift.

Although it is necessary to reverse the tractor for picking up and dumping a load, the time taken to fill a two-ton truck in a 35 t.p.a. crop is a little over 15 minutes.

The features of the implement which impress are the easy, speedy attachment and the construction of the runners which are so hinged to the frame that they follow ground contours and pick up a minimum of rubbish. The grab is most interesting and is operated by means of a lever behind the tractor driving seat. With the top jaws held in the open position, the runners collect a load and the jaws are then allowed to close. As the bundle is raised so the weight presses the rear ends of the runners against the stop bar of the release mechanism. When in position to unload, the release lever is pulled and at the same time as the jaws open the stop bar is directed towards the operator along a traverse guide. This allows the runners to swing free and the load falls downwards. On being lowered to the ground the implement assumes the position shown in the illustration.

Further developments planned are independent runners which, it is claimed, allow of cleaner bundling, and a hydraulically operated top jaw.

Wild Cane Collection in India

By J. H. BUZACOTT

The importance of the wild relative of sugarcane known as *spontaneum* has long been known to cane breeders and a number of varieties of this species have been used in the cane-breeding programmes of the major cane-growing countries of the world. Although a large number of types of *spontaneum* are known to exist and it is found growing wild in many countries, including Asia, Africa, Indonesia, New Guinea, the Philippine Islands and Taiwan, Asia has by far the greatest diversity of forms, many of which occur in India. In view of this fact and of the value of the species as an obvious progenitor of the thin Indian sweet canes, the Indian Central Sugar Cane Committee during recent years has sponsored a scheme for the assembly of as many types of *spontaneum* as possible. This scheme is called the Spontaneum Expedition Scheme and under it already a large number of varieties have been collected mainly by S. K. Mukherjee and R. R. Panje.

As a result of expeditions led by these two botanists there are now assembled at the Sugarcane Breeding Institute at Coimbatore in Southern India some 600 different types of *spontaneum* and other wild canes related to sugarcane (Fig. 95). It will be many years before these have all been sorted out and tested for their value in cane-breeding work. Mr. Panje, who is at present Sugar Cane Botanist at Coimbatore, is, however, not only interested in the breeding aspect of the collection, but he is also interested in endeavouring to trace the origin of the sweet types of sugarcane. He rightly considers that the elucidation of the origin of sugarcane lies in the intensive study of all its wild relatives.

Fig. 95—Wild cane collection at Coimbatore.

So far the Spontaneum Expedition Scheme has been confined mainly to Asia, but Mr. Panje is contemplating expeditions to other countries in the future. Already India has the largest collection of *spontaneum* varieties in the world and the value of this collection as a blood bank for cane breeders is inestimable.

A Useful Weedkiller

Wild canes such as the one illustrated in Fig. 96 play an important part in the parentage of modern sugar cane varieties because they transmit desirable characters, e.g., vigour, profuse stooling and resistance to some diseases. About twenty years ago some wild canes were introduced from overseas for breeding purposes. These canes are most vigorous growers and it is necessary to ensure that they do not spread from their experimental areas and become a pest. They may be kept in check by cultivation or grazed by cattle and horses. They appear to be resistant to the usual chemical weedicides. In the last few years the Bureau has introduced several more varieties and these are kept under control by growing them in small plots surrounded by concrete.

The plot of wild cane (*Saccharum spontaneum* Burma) shown in the photograph has been the subject of many experiments with a large number of weedkillers. The cane has shown extreme resistance and none of the chemicals provided a successful control until a mixture containing a boron compound (Borascu) and sodium chlorate was used. This weedicide brought about a very effective control in the treated area; the bare patch shown was treated about three months before the photograph was taken. The mixture, which acts as a soil sterilant, was applied at the heavy rate of 30 lb. per 100 square feet. The high cost of this treatment would be uneconomic except for special purposes.

Fig. 96—Effective control of wild cane at Cairns using a weedicide mixture containing a boron compound (Borascu) and sodium chlorate.

LGV, JCS AND GB.

Fig. 97—The Bureau is actively investigating the so-called *Verticillium* disease associated with poor ratooning. Here mill mud is being applied as an experiment at Bundaberg.

Fig. 98—Bagasse is also included in the research programme aimed at the control of *Verticillium* disease.

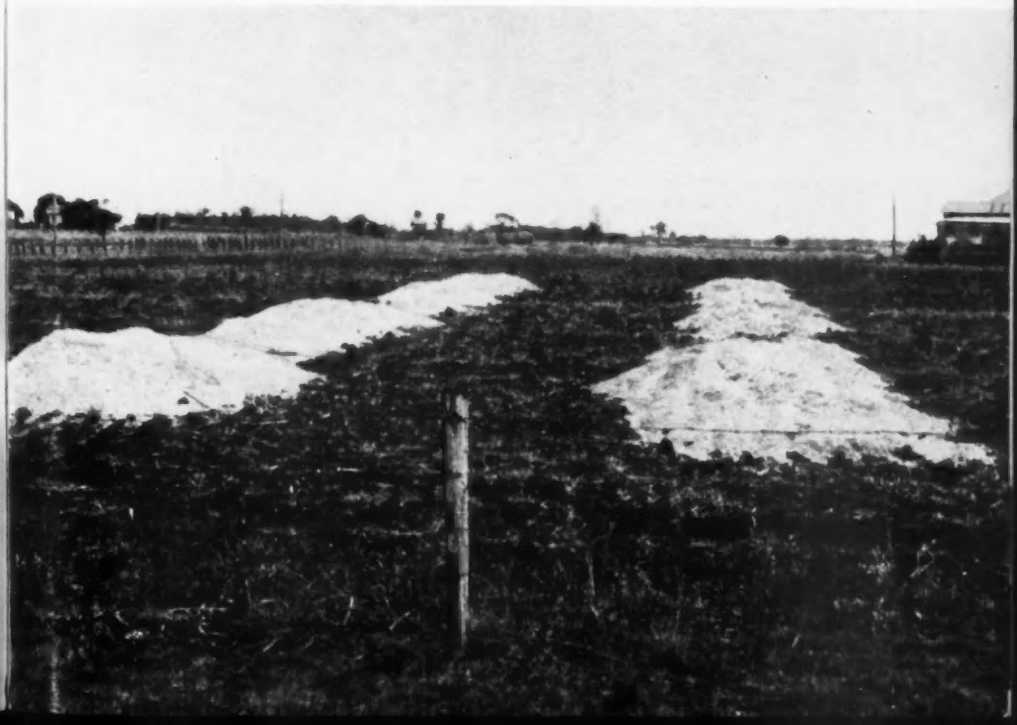

Fig. 99—Wild cane (*Spontaneum*) at El Alamein, Egypt. This picture was taken in October, 1942, during the desert campaign. Major E. J. Barke of the Bureau staff standing in the foreground.

Fig. 100—Bureau officers inspecting a patch of poor ratoons suspected of being affected by *Verticillium* disease, Bundaberg.

Fig. 101—The 9th Congress of the International Society of Sugar Cane Technologists was opened by the Union Minister for Food and Agriculture, Shri A. P. Jain (second from left) at Parliament House, New Delhi. Mr. N. J. King, General Vice-Chairman of the Congress, replies to the Minister's welcome.

Fig. 102—The Queensland delegation (absent—Dr. H. W. Kerr, Mr. H. E. B. Scriven) at the 9th Congress of the I.S.S.C.T. There were twenty-five sugar growing countries represented.

Fig. 103—A even strike of seedling canes on the sub-station at Innisfail (compare with Fig. 61, page 86, Quarterly Bulletin, January, 1956).

Fig. 104—Cane lands at Goondi. Bartle Frere in the distance.

Australian Tractor Testing Committee

The Editor's Note—In 1953 the Sugar Experiment Stations Board agreed to become a contributing party for a period of two years to the cost of establishing and maintaining the Australian Tractor Testing Committee. This Committee is a joint body established under agreement by the Commonwealth; the States of New South Wales, Victoria, South Australia, Western Australia and Tasmania; the Sugar Experiment Stations Board and the University of Melbourne. Under this agreement the tests are carried out by the University of Melbourne. The address of the Tractor Testing Committee is c/- Department of Commerce and Agriculture, 301 Flinders Lane, Melbourne.

In England and America, tractor testing by an independent body is an established principle. Because there are certain differences in tractors designed to operate under Australian conditions (fuel, compression ratios, wheel weighting, etc.), an Australian Testing Scheme seemed desirable. The Committee has now forwarded to us its first two Reports and the Farmers' Edition of these are reproduced in full in this issue of the *Quarterly Bulletin*. Additional copies may be obtained from this office.

REPORT ON TEST No. 24 (Farmers' Edition)

NEW FORDSON MAJOR—DIESEL MODEL

(Tested for the Ford Motor Company of Australia, Geelong)

This Report is taken from the full Technical Report No. 24 of this test; test results are shown here in briefer form; fuller explanations are added. Values quoted here may be rounded out to two instead of three significant figures; to this extent the values quoted may differ slightly but not significantly from those shown in the Technical Report. Graphs of belt test performance, shown in the Technical Report, are not shown here. The Technical Report is not available in large numbers, but may be seen at the offices of the State Departments of Agriculture, the Bureau of Sugar Experiment Stations (Queensland), and the Commonwealth Department of Commerce and Agriculture.

1. THE TESTS

(1) After twelve hours of running-in, two types of tests were carried out, in order to measure *the performance of the engine*, as measured by the power in the belt driven by the belt pulley, and *the performance of the tractor as a whole*, as measured by drawbar pull, tractor speed, wheel slip, and drawbar horsepower (d.b.h.p.), with the tractor running on a bitumen test track.

The main results of these tests are given in Sections 2, 3, and 4. Other measurements and observations were made of various features of the tractor; these are given in Section 5.

(2) FUEL MIXTURE SETTINGS.—The engine of this tractor has only one fuel-mixture setting, at which all the tests were carried out.

(3) GOVERNOR CONTROL. — For maximum loads the throttle was full open; for part loads the governor control was set to give rated speed at the desired loads.

(4) FUEL.—Distillate; Cetane No. 58; Specific Gravity 0.836; weight per Imperial gallon 8.36 lb.

(5) SPECIFICATION. — Engine No. 1273851. For a brief specification of this tractor see Section 6 at the end of this report.

2. SUMMARY OF POWER OUTPUT

Table A

	At the Belt	At the Drawbar
Rated engine speed, r.p.m.	1,600	1,600
Corrected maximum power (*a*) ..	39.4	36.4
Rated power (*b*) ..	33.5 (*b*1)	27.3 (*b*2)

NOTES—Letters in brackets refer to explanatory footnotes.

3. BELT TESTS

The belt tests show the power (belt horsepower, b.h.p.) that the tractor may be expected to deliver when driving a machine by the belt.

BELT TEST RESULTS.—

Table B

If there is only one fuel setting, no mention will be made of mixture settings in this table.

	B.H.P.	Engine Speed	Fuel	
			Gall./ hr. (*c*)	lb./ b.h.p. hr. (*d*)
1. Rated Engine Speed, 1,600 r.p.m.				
2. Fast Idling Speed about 1,730 r.p.m.				
3. Observed maximum b.h.p. at rated speed ..	38.7	1,601	2.21	0.48
4. Corrected maximum b.h.p. rated speed (*a*) ..	39.4	Observed maximum value corrected for atmospheric temperature and pressure at time of test.		
5. Calculated rated load (*b*1)	33.5			
6. Test at approximately rated load*	33.3	1,600	1.83	0.46
7. Average loading under governor (*e*)	29	1,630	1.3	0.54
8. Equivalent engine torque at full throttle ..	127 ft. lb. at maximum power and rated speed. 136 ft. lb. (maximum) at 1,100 r.p.m.			

*Governor set to run this test at approximately rated speed.

(a) Corrected maximum h.p. was calculated by a suitable formula from observed maximum h.p. corrected to 60°F. and 29.92" (sea level) barometric pressure.

(b) Engines are not expected to run indefinitely at full or maximum power output. But they can be expected to run continuously for some hours at *rated* output, which is less than maximum, defined as follows:—

(b1) Rated b.h.p. is defined as 85 per cent. of corrected maximum b.h.p.

(b2) Rated d.b.h.p. is defined as 75 per cent. of corrected maximum d.b.h.p.

(c) Fuel consumption in gallons/hour may be a simple unit, but it has no meaning unless we also quote the corresponding h.p. output.

(d) This is the "specific fuel consumption", the weight of fuel consumed per unit of energy developed by the engine; the unit of energy here is the h.p.-hour, similar to the electrical "unit" the kilowatt-hour. When this figure is least the engine is giving its best economy or efficiency. It is easy to change from column (c) to column (d) in Table B., e.g., as follows:—

2.21 galls./hr. while developing 38.7 h.p. means 2.21 ÷ 38.7 galls./b.h.p./hr. =0.057 gall./b.h.p./hr.

0.057 gall./b.h.p./hr. × 8.36 lb.gallon for this fuel = 0.48 lb./b.h.p./hr., as shown in column (d).

(e) Line 7, Table B., represents the average performance one might expect from the engine while driving a variety of belt loads, from light to heavy. In terms of average fuel consumption, it means about 1½ gallons an hour.

4. DRAWBAR TESTS

The following Tables, C, D, and E, show the drawbar performance of the tractor, on the bitumen test track, wearing rear tyres 14 x 28, carrying standard weight (1,990 lb. front, 5,630 lb. rear; total, 7,620 lb.), working in the gears named in the tables. Height of drawbar, 14 inches.

Drawbar tests, using minimum weight of tractor, were carried out, but are not reported here.

If there is only one fuel setting, no mention will be made of mixture settings in these tables.

(1) MAXIMUM POWER, RATED (3RD) GEAR.

Table C

	D.B.H.P. (*f*)	Pull lb.	Speed m.p.h.	Wheel Slip % (*g*)
1. Rated Engine Speed, 1,600 r.p.m.				
2. Observed maximum d.b.h.p. at rated engine speed	36.4	4,000	3.41	8
3. Corrected maximum d.b.h.p. at rated engine speed (*a*)	36.4	Observed maximum value above, corrected for atmospheric conditions at time of test.		
4. Calculated rated load (*b*2)	27.3			

(2) PULL AT MAXIMUM D.B.H.P.

Table D

All gears, rated engine speed.
See note (*h*).

Gear	D.B.H.P.	Pull lb.	Speed m.p.h.	Wheel Slip %
1	26	5,570	1.8	20
2	34	4,780	2.6	12
3	36	4,000	3.4	8
4	36	2,660	5.1	4
5	34	1,780	7.2	2
6	29	820	13.3	0½

(3) VARIOUS LOADS, RATED (3RD) GEAR*.

Table E

Pull, lb.	Speed m.p.h.	D.B.H.P.	Per cent. of Maximum d.b.h.p.	Slip %	Fuel	
					Gall./hr.	lb./ d.b.h.p. hr.
1,510	3.70	15	41	2	1.1	0.63
2,060	3.58	20	54	3	1.3	0.54
2,600	3.55	25	67	4	1.5	0.52
3,160	3.69	31	85	5	2.0	0.54

*Governor set to run these tests at approximately rated engine speed.

(4) INTERPRETATION OF DRAWBAR TESTS.

(i) Drawbar tests are carried out on a hard prepared surface. Most field conditions present higher resistance to the tractor's motion, so that, in the field, the maximum drawbar pulls available in any gear will usually be less than those shown in the tables.

(f) D.B.H.P. is the product of pull (lb.) and speed (m.p.h.) divided by 375.

(g) Wheel slip can be measured by noting that, in travelling a given distance, the back wheels make more turns when working under load than when running with no load on the drawbar. The difference in these revolution counts divided by the former count gives the slip as a ratio, which can be written as a percentage (quoted in these tables to the nearest whole number).

(h) These are not the maximum pulls available in the gears (i.e., not the maximum sustained pulls), but the pulls at maximum d.b. power, i.e., at full-throttle at rated engine speed.

(ii) Wheel slip may also be greater in the field; to that extent tractor speeds in miles per hour in the field will be less than those shown in the tables.

(iii) Because of (i) and (ii) above, the drawbar horsepowers available in any gear in the field will usually be less than those shown in the tables.

5. OTHER OBSERVATIONS

(1) DURATION OF TEST.—84 hours, including running-in.

(2) REPAIRS AND ADJUSTMENTS.—

(i) When received, it was found that the throttle stop on the intake manifold had been bent during assembly preventing full designed throttle opening. A new intake manifold was fitted. (The Company advises that this defect has been remedied in all subsequent tractors sent from the works.)

(ii) The tachometer supplied with the tractor broke down, possibly due to diesel fuel entering it.

(3) ENGINE.—

Fuel settings—One only.

Heat controls—radiator; hand-controlled shutter.

Radiator water used—none.

Lubricating oil—type used: S.A.E. 20.

Weight to engine, 15.3 lb.;

Weight from engine after tests, 14.2 lb.

(4) INSPECTION OF ENGINE AND TRANSMISSION AFTER TEST. — After testing, the tractor was partly dismantled and inspected and found to be in a satisfactory condition.

(5) TRACTOR WEIGHTS (lb.).

	Front	Rear	Total
*Minimum weight, unballasted ..	1,910	4,420	6,330
Added weights ..	..	..	..
Water ballast ..	..	980	980
†Standard weight, as usually supplied and recommended	1,930	5,380	7,310

*This weight, less driver, was used in finding centre of gravity.

†Weight of tractor in drawbar tests quoted in this report.

(6) WHEELS AND TYRES.—

Tyres	Front	Rear
Type ..	Rib	Closed centre bar tread
Size ..	7.50 x 16 x 6 ply	14 x 28 x 6 ply
Pressure	25 psi.	14 psi.

(7) STEERING. With track widths, front 54", rear 60".

Turning circles: Without brakes, 27' L.H., 27½' R.H.; with brakes, 24' L.H., 23½' R.H.

Comment: The tractor was easy to steer with the steering wheel while under load.

(8) CENTRE OF GRAVITY, with tractor in minimum weight less driver.—Height above ground, 2' 4". Distance forward of rear axle, 2'.

G. H. VASEY, Officer in Charge Tractor Testing.
I. T. NAYLOR, Tractor Testing Officer.
University of Melbourne.

6. BRIEF SPECIFICATIONS: New Fordson Major Diesel (Supplied by Manufacturers)

(1) ENGINE—No. 1273851 (Fordson, England).

4-stroke; 4 cylinders, vertical; crankshaft along tractor.

Bore, 3.937"; stroke, 4.528" compression ratio, 16 : 1.

Rated speeds: Belt work, 1,600 r.p.m.; drawbar work, 1,600 r.p.m.

Fuel type: Distillate.

Fuel system: Simms pump and injectors; fuel filters, two replaceable element units. Tank capacity, 15 gallons.

Air cleaner: Oil bath.

Governor: Type—pneumatic.

Electrical system: 12-volt battery and generator.

Starting: Electric, cold start.

Cooling: Water pump and fan, radiator shutters.

Exhaust: "Yuba" type combined muffler and spark arrester.

Lubrication: Oil pump and full-flow filter.

(2) CHASSIS—

4-wheel; pneumatic.

Wheel base, 80".
Track width: Front 54"; rear 60", adjustable.
Tyre sizes: Front 7.50 x 16; rear 14 x 28.
Steering gear: recirculatory ball.
Weight: Maximum weight 7,620 lb. (see "Other Observations," section 5).

(4) POWER TAKE-OFF—
Standard; guarded; location, centre rear.
Speed: 723 r.p.m., not in accordance with overseas standards namely, 536 ± 10 r.p.m.).
Dimensions: 6 spline, $1\frac{3}{8}$" diameter.
(5) DRAWBAR—Swinging.
Height as tested, 14", adjustable.

Fig. 105—The new Fordson Major, diesel model, subject of Tractor Test No. 24.

(3) BELT PULLEY—
Standard; right side, clockwise rotation.
Diameter $8\frac{1}{2}$"; face width $6\frac{1}{2}$".
Pulley speeds (at rated engine speed), 890 and 1,600 r.p.m.
Belt speeds (at rated engine speed), 1,980 and 3,560 ft./min., not in accordance with overseas standards (namely 3,100 ± 100 f.p.m.).

(6) TRANSMISSION — Conventional gears.
Clutch: Type, single dry plate; size, 11"; pedal control.
Gear ratios and road speeds (assuming no wheel slip) on 11.00 x 36 tyres, at rated engine speed, as advertised:—

Gear	Forward						Reverse	
	1	2	3	4	5	6	Low	High
Ratio	123	87.3	68.4	48.6	34.8	19.3	91.1	50.7
Speed, m.p.h.	2.1	2.9	3.7	5.2	7.3	13.2	2.8	5.0

(7) HYDRAULICS—Optional, not fitted.
(8) THREE-POINT LINKAGE—Optional, not fitted.

REPORT ON TEST No. 25 (Farmers' Edition)

NEW FORDSON MAJOR — KEROSENE MODEL

(Tested for the Ford Motor Company of Australia, Geelong)

This Report is taken from the full Technical Report No. 25 of this test; test results are shown here in briefer form; fuller explanations are added. Values quoted here may be rounded out to two instead of three significant figures; to this extent the values quoted may differ slightly but not significantly from those shown in the Technical Report. Graphs of belt test performance, shown in the Technical Report, are not shown here. The Technical Report is not available in large numbers, but may be seen at the offices of the State Departments of Agriculture, the Bureau of Sugar Experiment Stations (Queensland), and the Commonwealth Department of Primary Industry.

1. THE TESTS

(1) After twelve hours of running-in, two types of tests were carried out, in order to measure *the performance of the engine*, as measured by the power in the belt driven by the belt pulley, and *the performance of the tractor as a whole*, as measured by drawbar pull, tractor speed, wheel slip, and drawbar horsepower (d.b.h.p.), with the tractor running on a bitumen test track.

The main results of these tests are given in Sections 2, 3, and 4. Other measurements and observations were made of various features of the tractor; these are given in Section 5.

(2) FUEL MIXTURE SETTINGS.—The engine of this tractor has only one fuel-mixture setting, at which all the tests were carried out.

(3) GOVERNOR CONTROL. — For maximum loads the throttle was full open; for part loads the governor control was set to give rated speed at the desired loads.

(4) FUEL.—Power Kerosene, Octane No. 56; Specific Gravity 0.829; weight per Imperial gallon 8.29 lb.

(5) SPECIFICATION. — Engine No. 1273097. For a brief specification of this tractor see Section 6 at the end of this report.

2. SUMMARY OF POWER OUTPUT

Table A

	At the Belt	At the Drawbar
Rated engine speed, r.p.m.	1,600	1,600
Corrected maximum power (*a*) ..	32.3	29.0
Rated power (*b*) ..	27.5 (*b*1)	21.8 (*b*2)

NOTE.—Letters in brackets inside the tables refer to explanatory footnotes.

3. BELT TESTS

The belt tests show the power (belt horsepower, b.h.p.) that the tractor may be expected to deliver when driving a machine by the belt.

Table B

BELT TEST RESULTS.—

If there is only one fuel setting, no mention will be made of mixture settings in this table.

(a) Corrected maximum h.p. for carburettor engines is calculated by a suitable formula from observed maximum h.p. corrected to 60°F. and 29.92" (sea level) barometric pressure.

(b) Engines are not expected to run indefinitely at full or maximum power output. But they can be expected to run continuously for some hours at *rated* output, which is less than maximum, defined as follows:—

(b1) Rated b.h.p. is defined as 85 per cent. of corrected maximum b.h.p.

(b2) Rated d.b.h.p. is defined as 75 per cent. of corrected maximum d.b.h.p.

	B.H.P.	Engine Speed	Fuel	
			Gall./ hr. (*c*)	lb./ b.h.p. hr. (*d*)
1. Rated engine speed, 1,600 r.p.m.				
2. Fast idling speed, about 1,720 r.p.m.				
3. Observed maximum b.h.p. at rated speed ..	31.8	1,599	2.75	0.72
4. Corrected maximum b.h.p. rated speed (*a*) ..	32.3	Observed maximum value corrected for atmospheric temperature and pressure at time of test.		
5. Calculated rated load (*b*1)	27.5			
6. Test at approximately rated load*	27.0	1,603	2.54	0.78
7. Average reading under governor (*e*)	17	1,640	2.1	1.0
8. Equivalent engine torque at full throttle ..	104 ft. lb. at maximum power and rated speed. 125 ft. lb. (maximum) at 986 r.p.m.			

*Governor set to run this test at approximately rated speed.

4. DRAWBAR TESTS

The following Tables, C, D, and E, show the drawbar performance of the tractor, on the bitumen test track, wearing rear tyres 14 x 28, carrying standard weight (1,930 lb. front, 5,380 lb. rear; total, 7,310 lb.), working in the gears named in the tables. Height of drawbar, 14½ inches.

Drawbar tests, using minimum weight of tractor, were carried out, but are not reported here.

If there is only one fuel setting, no mention will be made of mixture settings in these tables.

Table C—(1) MAXIMUM POWER, RATED (3RD) GEAR.

	D.B.H.P. (*f*)	Pull lb.	Speed m.p.h.	Wheel Slip % (*g*)
1. Rated engine speed, 1,600 r.p.m.				
2. Observed maximum d.b.h.p., at rated engine speed	29.2	3,160	3.46	7
3. Corrected maximum d.b.h.p., at rated engine speed (*a*)	29.0	Observed maximum value above, corrected for atmospheric conditions at time of test.		
4. Calculated rated load (*b*2)	21.8			

(c) Fuel consumption in gallons/hour may be a simple unit, but it has no meaning unless we also quote the corresponding h.p. output.

(d) This is the "specific fuel consumption", the weight of fuel consumed per unit of energy developed by the engine; the unit of energy here is the h.p.-hour, similar to the electrical "unit", the kilowatt-hour. When this figure is least the engine is giving its best economy or efficiency. It is easy to change from column (c) to column (d) in Table B., e.g., as follows:—

2.75 galls./hr. while developing 31.8 h.p. means 2.75 ÷ 31.8 gall./b.h.p./hr. = 0.087 gall./b.h.p./hr.

0.087 gall./b.h.p./hr. × 8.29 lb./gallon for this fuel = 0.72 lb./b.h.p./hr., as shown in column (d).

(e) Line 7, Table B., represents the average performance one might expect from the engine while driving a variety of belt loads, from light to heavy. In terms of average fuel consumption, it means about 2 to 2¼ gallons an hour.

(f) D.B.H.P. is the product of pull (lb.) and speed (m.p.h.) divided by 375.

(g) Wheel slip can be measured by noting that, in travelling a given distance, the back wheels make more turns when working under load than when running with no load on the drawbar. The difference in these revolution counts divided by the former count gives the slip as a ratio, which can be written as a percentage (quoted in these tables to the nearest whole number).

Table D

(2) PULL AT MAXIMUM D.B. H.P.

All gears, rated engine speed.
See note (*h*).

Gear	D.B.H.P.	Pull lb.	Speed m.p.h.	Wheel Slip %
			m.p.h.	%
1	24	5,400	1.7	20
2	29	4,170	2.6	10
3	29	3,160	3.5	7
4	29	2,190	5.0	4
5	28	1,500	7.1	2
6	20	580*	13.0	½

* The accuracy of the drawbar dynamometer at this load is suspect.

5. OTHER OBSERVATIONS

(1) DURATION OF TEST.—68 hours, including running-in.

(2) REPAIRS AND ADJUSTMENTS.—It was necessary to bend arm from governor to throttle valve to ensure extreme throttle opening.

(3) ENGINE.—

Fuel settings—One only.

Heat controls—radiator; hand-controlled shutter; vaporiser.

Radiator water used—none.

Lubricating oil—type used: S.A.E. 30.

Weight to engine, 15.4 lb.;
Weight from engine after tests, 17.7 lb.

Table E—(3) VARIOUS LOADS, RATED (3RD) GEAR*.

Pull, lb.	Speed m.p.h.	D.B.H.P.	Per cent. of Maximum d.b.h.p.	Slip %	Fuel	
					Gall./hr.	lb./ d.b.h.p. hr.
1,320	3.50	12	42	2	1.9	1.25
1,830	3.54	17	60	3	2.1	1.00
2,320†	3.55	22†	76†	3	2.3	0.87
2,820	3.54	27	92	4	2.6	0.79

* Governor set to run these tests at approximately rated engine speed.
† Approximately the rated drawbar load.

(2) INTERPRETATION OF DRAWBAR TESTS.

(i) Drawbar tests are carried out on a hard prepared surface. Most field conditions present higher resistance to the tractor's motion, so that, in the field, the maximum drawbar pulls available in any gear will usually be less than those shown in the tables.

(ii) Wheel slip may also be greater in the field; to that extent tractor speeds in miles per hour in the field will be less than those shown in the tables.

(iii) Because of (i) and (ii) above, the drawbar horsepowers available in any gear in the field will usually be less than those shown in the tables.

(4) INSPECTION OF ENGINE AND TRANSMISSION AFTER TEST. — After testing, the tractor was partly dismantled and inspected and found to be in a satisfactory condition.

(5) TRACTOR WEIGHTS (lb.).

	Front	Rear	Total
*Minimum weight, unballasted ..	1,990	4,510	6,500
Added weights ..	..	..	..
Water ballast ..	..	1,120	1,120
†Standard weight, as usually supplied and recommended	1,990	5,630	7,620

* This weight, less driver, was used in finding centre of gravity.
† Weight of tractor in drawbar tests quoted in this report.

(h) These are not the maximum pulls available in the gears (i.e., not the maximum sustained pulls), but the pulls at maximum d.b. power, i.e., at full-throttle at rated engine speed.

(6) WHEELS AND TYRES.—

Tyres	Front	Rear
Type ..	Rib	Open centre bar tread
Size ..	7.50 x 16 x 6 ply	14 x 28 x 6 ply
Pressure	25 psi. ..	14 psi.

(7) STEERING. With track widths, front 54", rear 60".

Turning circles: Without brakes, 28½' L.H., 27½' R.H.; with brakes, 25½' L.H., 25' R.H.

Comment: The tractor was easy to steer with the steering wheel while under load.

(8) CENTRE OF GRAVITY, with tractor in minimum weight less driver.—Height above ground, 2' 4". Distance forward of rear axle, 2'.

G. H. VASEY, Officer in Charge Tractor Testing.

I. T. NAYLOR, Tractor Testing Officer.
University of Melbourne.

6. BRIEF SPECIFICATIONS:

New Fordson Major Kerosene (Supplied by Manufacturers)

(1) ENGINE — No. 1273097 (Ford, England).

4-stroke; 4 cylinders, vertical; crankshaft along tractor.

Bore, 3.937"; stroke, 4.528" compression ratio, 4.62 : 1.*

Rated speeds: Belt work, 1,600 r.p.m.; drawbar work, 1,600 r.p.m.

Fuel type: Power kerosene.

Fuel system: Mechanical fuel pump and fixed jet carburettor. Tank capacity, 14 gallons plus 1 gallon petrol tank.

Air cleaner: Oil bath.

Governor: Mechanical.

Electrical and Ignition system: 12-volt battery, generator, coil.

Starting: 12-V electric; petrol fuel.

Cooling: Water pump and fan, radiator shutters.

Fig. 106—The new Fordson Major, kerosene model, subject of Tractor Test No. 25

* Engine tests with a cylinder head giving a compression ratio of 5.5 to 1 were carried out (Test No. 25A) but are not reported here.

Exhaust: "Yuba" type combined muffler and spark arrester.
Lubrication: Oil pump and full-flow filter.

(2) CHASSIS—
4-wheel; pneumatic tyres.
Wheel base, 80".
Track width: Front 54"; rear 60", adjustable.
Tyre sizes: Front 7.50 x 16; rear 14 x 28.
Steering gear: recirculatory ball.
Weight: Maximum weight 7,310 lb. (see "Other Observations," section 5).

(3) BELT PULLEY—
Standard; right side, clockwise rotation.
Diameter 8½"; face width 6½".
Pulley speeds (at rated engine speed), 890 and 1,600 r.p.m.
Belt speeds (at rated engine speed), 1,980 and 3,560 ft./min., not in accordance with overseas standards (namely 3,100 ± 100 f.p.m.).

(4) POWER TAKE-OFF—
Standard; guarded; location, centre rear.
Speed (at rated engine speed): 723 r.p.m., not in accordance with overseas standards (namely, 536 ± 10 r.p.m.).
Dimensions: 6 spline, 1⅜" diameter.

(5) DRAWBAR—Swinging.
Height as tested, 14½", adjustable.

(6) TRANSMISSION — Conventional gears.
Clutch: Type, single dry plate; size, 11"; pedal control.
Gear ratios and road speeds (assuming no wheel slip) on 11.00 x 36 tyres, at rated engine speed, as advertised:—

Gear	Forward						Reverse	
	1	2	3	4	5	6	Low	High
Ratio	123	87.3	68.4	48.6	34.8	19.3	91.1	50.7
Speed, m.p.h.	2.1	2.9	3.7	5.2	7.3	13.2	2.8	5.0

(7) HYDRAULICS—Optional, not fitted.

(8) THREE-POINT LINKAGE—
Optional, not fitted.

Fertilizer requirements of the Soils of the Calavos District, Bundaberg

By K. C. LEVERINGTON

During the expansion of the Queensland sugar industry in the post-war years, many instances have occurred where it has been found necessary to open up land of other than the proven alluvial, volcanic and forest soils in order to provide the extra acres demanded by increased mill peaks. Although this land was usually the best available in the particular district, it was often known to be below the standard of fertility of existing farms, despite the fact that stands of good timber covered much of the proposed new areas. Such a district was at Calavos, to the south of Bundaberg, and it is proposed to discuss the fertility of the area in the light of information gained from a recent soil survey in the area.

The soils under review are grey to grey brown loams and clay loams with occasional sandy variations. They frequently overlie a yellowish clay sub-soil which shows signs of impeded drainage conditions. The drainage of the area in general is variable, ranging from good in the sandy phases to rather poor in the lower clay loam regions where the soil tends to be water-logged in the wet seasons. Before the war, cultivation was limited to a few cane farms and a few farms producing tobacco. A considerable increase in the areas

under both crops has followed the post-war boom and now many farmers are growing both cane and tobacco sometimes in the form of a rotation.

Although many of the farms are producing reasonable crops of sugar cane, the chemical analyses of the soils have borne out the wisdom of the early farmers, in the days when little was known about cane fertilizers, when they avoided these soils on opening up the Bundaberg district for cultivation. Generally the soils have been found to have a very limited supply of the major plant foods available to the crops and it will be necessary for growers to adhere to a strict fertilizer programme if the soils are to be built up into a good and highly economic state of productivity.

From the accompanying table, in which are recorded the number of soils at various fertility levels of phosphate and potash, some indication can be gained of the infertile nature of the Calavos area.

Plant Food	Very Deficient	Slightly Deficient	Satisfactory	Total
Phosphate ..	14	0	2	16
Potash	15	1	0	16

It is of interest to note that 87 per cent. of these Calavos soils are very deficient in phosphate and 94 per cent. very deficient in potash. These results should be compared with those of the 550 soils from the Bundaberg district examined in the last two years, in which only 56 per cent. were very deficient in phosphate and 51 per cent. very deficient in potash. Another interesting point is that the two soils which are well supplied with phosphate are from old fields which have been cultivated and fertilized for many years. The three virgin soils examined, and all of the soils under their first crop cycle are extremely deficient in this important plant food.

The analytical results show that it is essential, even on new land, for growers to apply heavy dressings of suitable mixtures to these grey soils if a worthwhile crop is to be produced. Generally speaking, Sugar Bureau Mixture No. 2 at the rate of 5 cwt. per acre will be found to be the most suitable basic fertilizer, although on some of the brownish phases where the phosphate status is slightly better than on the grey soils, Sugar Bureau Mixture No. 3 at 5 cwt. per acre may prove more satisfactory.

As in most areas, the nitrogen status of these soils is not sufficient to produce satisfactory cane crops without the addition of nitrogenous fertilizer, and therefore top dressings of sulphate of ammonia must be applied to plant and ratoon crops. The Bureau recommends that for this soil type the top dressing should be 1 bag per acre on plant cane and 1½ bags per acre on ratoons, i.e., 160 lb. and 240 lb. per acre respectively. Green manure crops could also be used to advantage on these soils both to increase the supply of nitrogen and to add organic matter to build up the soil's physical condition.

It must be borne in mind, however, that to get results from green manure crops it is essential that suitable bacteria be present in the soil to fix atmospheric nitrogen for subsequent release to the soil when the green manure crop is turned in. It is recommended that all seeds to be planted be treated with a special culture obtainable from the Bureau's Brisbane office so that the maximum benefit may be derived. If a good green manure crop, thus inoculated, is ploughed in prior to planting the cane, the nitrogenous top dressing may then be omitted from that plant crop.

All the soils examined gave a satisfactory reaction when tested for acidity, and it is thus very unlikely

that any response could be expected from the use of lime on these soils.

While the natural fertility of the Calavos area may be described as poor, there is no reason why, with the intelligent use of correct fertilizers, the growing of green manure crops and the planting of the most suitable cane varieties, that the level of productivity of this locality could not be raised to equal the average yields of the Bundaberg district.

Applying Sulphate of Ammonia by Aeroplane

The accompanying illustration depicts the first attempts to apply fertilizer by aircraft to sugar cane in Queensland. The experiment was carried out by Agricultural Aviation Pty. Ltd. in co-operation with the Bureau at our Pathology Sub-station, Eight Mile Plains. In this first exploratory trial sulphate of ammonia was used and applied at the rate of 2 cwt. per acre, which is the usual top-dressing on this cane. Although, naturally, a considerable proportion of the dressing lodged on the leaves, subsequent inspection after several days showed no damage or fertilizer burn. The material flowed freely from the equipment and an even spread was obtained. For comparison purposes a portion of the area was fertilized by hand using the same rate per acre. Any differences in either cane or weed growth will be of interest.

In overseas countries this method of fertilizing is becoming increasingly popular and, in Hawaii, aerial nitrogen application using the free-running granulated urea is a standard practice. There seems little doubt that the cane plant can assimilate part of its plant food through the leaf, and this applies particularly to nitrogen.

Although the patch of cane was a small one and in an area confined by a belt of trees and overhead power lines, the operator was able to broadcast the fertilizer exactly on the block without overlapping of runs or overrunning of ends. In watching the application the impression was gained that further investigation on a larger scale would be well worthwhile.

LG.V. and C.G.H.

Fig. 107—Aerial application of sulphate of ammonia to cane at the Bureau's Pathology Sub-station, Eight Mile Plains, near Birsbane.

Marcotting Cane in India

By J. H. BUZACOTT

As part of the cane-breeding programme at the Sugar Cane Breeding Institute at Coimbatore, in Southern India, it is customary to *marcot* the stalks of cane varieties, which are to be used as parents, as a method to reduce the height of stalks used in cross-pollination. Marcotting is a common practice used by horticulturists in the propagation of fruit trees such as lichee and mango which are either slow to bear when grown from seed or do not breed true. It consists of surrounding a section of a limb of a tree with soil which is kept well moistened. In woody trees it is necessary to remove an annular strip of bark about one inch in length where the marcot is to be made in order to form a callus from which roots will develop. In sugar cane this is unnecessary as root primordia are present at every node and it is therefore only necessary to apply a marcot to any node of the cane stalk.

Formerly the soil was kept in position with bands of sacking, and this required to be watered daily to make up for evaporation losses. Plastic tubes are now used in India for the purpose and these are tied above and below the node which it is desired to marcot (Fig. 108). Before tying the top of the tube soil is packed in around the stem and well watered. The soil in the plastic tubes requires no further watering and within ten days or so roots develop strongly. The stalk can then be cut off below the marcot and the new plant, with the plastic removed,

Fig. 108—Soil in plastic bags tied around sugar cane to induce rooting at the node.

Fig. 109—Indian workers tying bags of soil around canes.

planted in the ground. The height at which the marcot is made above the ground is determined by the height at which it is desired that the flower will ultimately be produced.

Stalks to be used for cross-pollination are not marcotted until the arrows have started to form and, in addition to reducing the height of the arrow above the ground, the process also serves to bring the flowers of different varieties, which are being cross-pollinated, to the same level, since one of the major difficulties in cross-pollinating sugar cane varieties, which are growing side by side, is that both the stems and the flower stalks of different varieties vary greatly in length. A

knowledge of the length of the flower stalks enables the marcot to be made at the correct height on each variety, so that the transplanted marcots will flower at approximately equal heights. Indian labourers marcotting stalks of sugar cane at the Coimbatore Sugarcane Breeding Institute are shown in Figure 109.

In Queensland where, during cross-pollination, the stalks of arrowed cane are kept alive in a sulphur dioxide solution, marcotting at the time of arrowing has not been practised in the past. It is hoped that the method will prove useful in providing short stalks for conducting future experiments in pollen production in the glasshouse and also for experiments in the control of flowering by shortening day length.

Random Gleanings

One disease which Queensland's active quarantine measures have kept out of the cane crops of this State is that known as "leaf scorch" which is caused by the fungus *Stagonospora sacchari*. As its name implies, its chief symptom is a scorching and death of the green blade of the leaf. This loss of photosynthetic area leads to early cessation of growth and actual loss of tonnage. Control is only possible through the use of comparatively resistant varieties. The disease is only known to occur in Taiwan and the Philippines and, apart from N.Co. 310, which is more or less resistant, we do not know the reactions to the disease of any commercial Queensland variety.

Interesting news on the virus front recently came from the group of research workers at Berkeley, California. By suitable treatments of different batches of the one virus disease material they were able to prepare two non-infective principles which, when put together, were capable of producing the disease. The work has to be confirmed but, if it is proved, it may help give an answer to the question as to what makes a virus particle infective, and that may be very close to the secret of life itself.

Farmers these days must surely get confused with the multiplicity of fertilizer mixtures that are available to them. Some of these are given a name of some sort, dozens of them are called by a number, and in addition, there are all kinds of "Specials". Although the information the farmer usually wants to know is printed on the label, very often these figures do not mean a great deal to a busy man who just hasn't time to decipher them. In the next issue of this Bulletin "Some Facts on Fertilizers" will be published. This article contains information useful to the grower who is really interested in knowing the practical value of the plant nutrients contained in this most expensive material.

Proclamations concerning the agricultural side of the sugar industry issued by the Governor-in-Council within recent months fall into two groups, viz.: 1.—Proclamations cancelling quarantines already operating, and 2.—Proclamations dealing with the compulsory use of planting material which is free from ratoon stunting disease. The first group is a logical development of the elimination of gumming, downy mildew and Fiji diseases from former infected areas, and the second is a result of the advances that have been made in the control of ratoon stunting disease by the provision of clean plants. It is now compulsory, or will be shortly, for all growers in the Babinda, Bundaberg, Burdekin, Isis, Maryborough, Mulgrave, Plane Creek, Proserpine and Tully areas to plant only clean material. The Cane Pest and Diseases Control Boards are to be congratulated on the energy with which they have tackled the hot-water treatment of large quantities of cane.

Droopy Top in Cane

By J. ANDERSON

Early last year a small field of cane in the Innisfail area was found exhibiting severe symptoms of droopy top, a complaint which is believed to be due to a deficiency of one or more of the minor elements . Actually this finding was of no great economic significance for two reasons. Firstly, the area was on the fringe of poor forest country not generally cultivated, and secondly, of more importance, the surface soil of the small block had been

Fig. 110—Note the leaf striping on this "droopy top" stool of Pindar.

Fig. 111—The row in the foreground is badly affected with "droopy top." Normal growth in background.

heavily graded off for filling during the construction of a new tramline. Because the land had been graded and cleared and a small area was required for a "clean seed" bed, the grower decided to place this patch under cane. A portion of the remaining virgin forest country was also brought into the block. When ploughed and grubbed, the soil in the graded portion was virtually that of sub-soil and following germination, patches of droopy top soon appeared. The cane in the untouched virgin area grew normally.

It is felt that the grading of the land and removal of the top soil brought about a minor element deficiency and therefore the accompanying photographs are of considerable interest. Fig. 110 shows a close-up view of a stool of Pindar severely affected by droopy top. The drooping foliage and the striping effect within the leaf can be readily noticed. Fig. 111 shows the characteristic appearance of severely affected stools of Pindar within the field. Unaffected cane can be seen in the background. In Fig. 112 are two stools, again of Pindar, removed from the field, exhibiting droopy top and photographed with a normal stalk for comparison.

In each case it can be observed that the droopiness is quite characteristic of the complaint and not due to any normal wilting, in which case the leaves would be curled and rolled. Stools affected by droopy top are usually weak and stunted, with the trash clinging to the stalk. While the leaves develop a pronounced striping effect and droop in a spectacular manner, the stalk and spindle become rubbery and can be bent easily without snapping. Also the foliage appears wider and "softer" than is normal and, in fact, recognition of the variety becomes rather deceptive.

Fig. 112—Two affected "droopy top" stools compared with a top of an unaffected stalk of the same age, variety—Pindar.

It is difficult to be definite as to which mineral deficiency is responsible for the symptoms. In other areas, notably Mackay and Nambour, applications of copper and zinc are usually effective in preventing the occurrence of this abnormal type of growth.

FREE SERVICES TO CANE GROWERS

The Bureau offers the following free services to *all* cane growers in Queensland:—

Soil Analysis and Fertilizer Recommendations

Your soil will be analysed by the most modern methods, and a report will be posted containing a recommendation covering the type of fertilizer required, the amount per acre, the need for lime, and other relevant information. Phone the nearest Bureau office and the soil samples will be taken as soon as possible.

Culture for Green Manure Seed

The Bureau laboratories in Brisbane will post to any cane grower sufficient fresh culture to inoculate seed of cowpeas, velvet beans, mung beans or other types being grown. Instructions for use of the culture will be enclosed. Address your request to The Director, Bureau of Sugar Experiment Stations, Brisbane, *but allow at least a week, after receipt of your letter, for the culture to be prepared and posted.*

Advice on All Phases of Cane Growing

The Bureau staff is at the service of all cane growers. They can best advise you on matters pertaining to varieties, fertilizers, diseases, pests, drainage and cultural methods. Bureau officers are available in every major cane growing district. A phone call will ensure a visit to your farm.